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Basic Patent (Number,Kind,Date): CA 2180057 AA 19971228

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USE OF SURFACTANTS IN PASTE PRINTING INK (English; French)
Patent Assignee: SHARMA SANDEEP (CA)
Author (Inventor): SHARMA SANDEEP (CA)
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USE OF SURFACTANTS IN PASTE PRINTING INK UTILISATION DE SURFACTANTS DANS DES PATES D'IMPRESSION (English; French)
Patent Assignee: SHARMA SANDEEP (CA)
Author (Inventor): SHARMA SANDEEP (CA)
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(54) **UTILISATION DE SURFACTANTS DANS DES PATES D'IMPRESSION**

(54) **USE OF SURFACTANTS IN PASTE PRINTING INK**

(57) La présente invention vise une encre d'imprimerie en pâte contenant un solvant convenable, une résine dure, des pigments et d'autres additifs typiques. L'amélioration comprend l'addition d'une petite quantité de surfactif à l'encre d'imprimerie pour la rendre lavable à l'eau lors du nettoyage. L'invention vise aussi une méthode de nettoyage de la presse avec une solution aqueuse; la méthode couvre l'utilisation d'une encre d'imprimerie ordinaire à laquelle une petite quantité de surfactif a été ajoutée en combinaison avec une solution acide en fontaine et le lavage de la presse avec une solution de lavage à un pH allant de 8,5 et 13,5 environ la solution de lavage contient un détergent et une petite quantité de surfactif.

(57) The present invention is directed to a paste printing ink containing a suitable solvent, a hard resin, pigment and other typical additives, the improvement comprising the addition of a small amount of a surfactant to the printing ink to enable the ink to be water washable on clean-up. The invention is also directed to a method for cleaning the printing apparatus with an aqueous cleaning solution, the method comprises utilizing a conventional printing ink to which a small amount of surfactant has been added in combination with an acidic fountain solution and washing the printing apparatus with a aqueous washing solution at a pH of between about 8.5 and 13.5, the washing solution containing detergent and a small amount of surfactant.

2180057

TITLE: USE OF SURFACTANTS IN PASTE PRINTING INK

FIELD OF THE INVENTION

The present invention relates to paste printing inks for use in lithographic printing processes in which the printing inks may be cleaned by an aqueous cleaning solution. The invention also relates to aqueous washing solutions for cleaning such inks from the printing units and the preferred method of cleaning.

BACKGROUND OF THE INVENTION

A wide variety of printing processes are in general use, of which, one of the most common is the lithographic printing process. Lithography is a method of printing which relies on differences in solubility and surface wetability between an oil based component, generally the ink, and an aqueous based component, generally the fountain solution, to transfer the printing ink to the desired image area and prevent the ink from transferring to the non-image area. Lithography commonly utilizes a printing plate which is treated to provide an oleophilic or hydrophobic ink accepting image area and an oleophobic or hydrophilic ink repelling non-image area. During the lithographic printing process, an oil based or water insoluble ink composition and an aqueous fountain solution are applied to the printing plate. The fountain solution is attracted to and preferentially wets the oleophobic or hydrophilic non-image areas while the ink is attracted to and wets the oleophilic or hydrophobic image areas. Lithographic printing requires inks which are water insoluble under the conditions utilized by aqueous fountain solutions, which are generally acidic in nature. If the ink does not have this water insolubility, then there will be some bleeding of the ink into the fountain solution which will result in poor print quality, poor edge definition, dot gain and other various print deficiencies. Thus, the lithographic inks are generally formulated to remain stable, cohesive and insoluble when in contact with aqueous solutions under the

conditions commonly employed in the lithographic printing process.

The ink composition and fountain solutions are applied to the printing plate through a variety of methods and roller configurations common in the art. Once applied to the printing plate they are distributed to their respective areas and transferred either directly to the paper or an intermediate blanket cylinder which then transfers the ink to the paper. The now obsolete direct transfer of the ink from the printing plate to the paper is known as direct lithographic printing while the transfer going through the intermediate blanket cylinder is generally referred as offset lithography. In offset lithography, the blanket cylinder is covered with a transfer substrate, typically rubber, which receives the ink from the printing plate and transfers it to the print substrate.

When a printing job is completed, the printing plates are changed and the print train, especially the transfer cylinder in an offset process, must be cleaned to remove the ink residues which are present from the job. In addition, during the printing job if a change of ink is required, then the entire print train including application rollers, print plates and the transfer cylinder must be cleaned. In the past, such cleaning has generally been accomplished using an appropriately formulated organic wash solvent. It was necessary to use organic wash solvents to effectively dissolve or sufficiently disperse the ink as the inks themselves are oil based, water insoluble compositions. In recent years, there have been pressures to diminish the use of organic solvents in all printing processes as such solvents are generally based upon petroleum distillates. Inks and wash solvents produced utilizing petroleum distillates suffer from a number of major drawbacks. Petroleum is a non-renewable resource; an organic solvent which gives rise to employee safety

concerns as well as being a source of air and water pollution since volatile organic compounds (VOCs) are dispersed into the atmosphere or disposal system.

There have been attempts in the past to develop water based wash or cleaning solutions in order to reduce the presence of VOCs emitted during the washing process. To date, the closest to achieving this goal has been the processes and products developed by the Deluxe Corporation as described in U.S. Patents 5,308,390, 5,382,282, 5,354,366 and 5,388,351. These patents describe ink compositions incorporating a water reducible resin which is water insoluble under certain conditions and selectively water washable under other conditions. The resins are selected to be water insoluble under the conditions employed in fountain solutions, i.e. at acidic pHs, and water washable under alkaline pHs. This is achieved by utilizing a water reducible acid functional resin having an acid number such that the resin is water insoluble at an acidic pH level while being water soluble or water washable at an alkaline pH level. The resin is preferably selected to have acid numbers in the range of from about 25 to 200 and most preferably between 25 and 100. A surfactant may be employed in the ink to reduce the amount of water reducible resin needed to render the ink or varnish water washable. The use of the water reducible resins have the drawbacks of not being suitable for use in all printing processes and not producing a higher quality print job as compared to a ink formulated using a traditional hard resin.

SUMMARY OF THE INVENTION

The present invention is based in part upon the finding that the incorporation of a small amount of surfactant in a typical paste printing ink renders the paste printing ink water washable on clean-up without requiring the addition of water reducible resins.

In a preferred embodiment, the present invention provides for a paste printing ink containing a suitable solvent, a hard resin, pigment and other typical additives, the improvement comprising the addition of a small amount of at least one surfactant to the printing ink to enable the ink to be water washable on clean-up.

In an aspect of the invention, there is provided a method for cleaning the printing apparatus with an aqueous cleaning solution, the method comprises utilizing a conventional printing ink, to which a small amount of surfactant has been added, in combination with an acidic fountain solution and washing the printing apparatus with a aqueous washing solution at a pH of between about 8.5 and 13.5, the washing solution containing some detergent and a small amount of surfactant.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The present invention is directed to a paste printing ink for use in the lithographic printing process, the paste ink being washable with aqueous wash solutions during the clean-up, thus eliminating the need for wash solutions based upon volatile organic compounds (VOCs).

The inks of the present invention are suitable for use in a wide range of printing ink systems including business forms inks, sheetfed inks, heatset inks, small offset duplicator inks, coldset offset news inks, UV inks and metal decorating inks.

The inks of the present invention are based on typical printing inks commonly utilized in lithographic processes. Such printing inks contain a suitable pigment in a printing ink vehicle. The insoluble pigment is a colourant material which provides the colour and desired level of transparency and is selected not to bleed into the fountain solution. The printing ink vehicle carries the

pigment and also holds it by binding to the substrate. Such vehicles should be resistant to excessive emulsification and must dry as required. The vehicle is the medium in which the pigments and other additives are suspended and is typically made up of hard resin, alkyd, vegetable oil, petroleum distillate or other solvents, co-solvent, rheological modifier and/or anti-oxidants in certain ratio and provides the required gloss, film integrity, suitable shelf life and end use requirements.

The hard resins of the ink contributes most to such properties as setting, film integrity, hardness and gloss of the film, the adhesion to the substrate and rub resistance. The resins are selected based on properties such as viscosity, solubility, compatibility, tack, molecular weight, polarity, reactivity, colour and acid value, which is preferred to be relatively low. Preferably, the acid value of the resin will be less than 35 and generally on the order of 15 to 25. Types of resins commonly utilized in printing inks include rosin derivatives, specifically gum rosin, wood rosin and tall oil resin with gum rosin being the most preferred.

Amongst conventional ink resins are rosin derived resins, in particular, esters of rosin and modified rosin, synthetic rosin modified hydrocarbon resins and cyclized rubber. As will be readily appreciated by those of skill in the art, the choice of the particular resin to be utilized in the printing ink vehicle will be made on the basis of the desired properties of the finished product, namely the printed material.

Preferred hard resins for the printing ink vehicles of the present invention are those derived from rosin, in particular, esters of rosin, more particularly, esters of phenolic modified rosin, esters of rosin adducts and esters of dimerized rosin, most particularly esters of phenolic modified rosin. All of these resins are commercially

available for example, esters of phenolic modified rosin are available under the trademarks PENTREX 1200 (Hercules Inc.), KRUMBHAAR K-2300 (Lawter International, Inc.) and FILTREZ 682 (Akzo Coatings Inc.). Esters of rosin adducts are available under the trademarks PENTALYN G, PENTALYN X and PENTREX 816 (all from Hercules Inc.) and KRUMBHAAR K-333 (Lawter International, Inc.), while an ester of dimerized rosin is available under the trademark PENTALYN K (Hercules Inc.)

The vehicle may also optionally include synthetic hydrocarbon resins including functional hydrocarbon resins and non-functional hydrocarbon resins. The functional hydrocarbon resins are resins which contain functional groups and are utilized to increase the unsaturation for inks which dry by oxidation such as sheetfed inks. Such resins may also increase the acidity required for gelation. Non-functional hydrocarbon resins, specifically aromatic hydrocarbon resins or aliphatic hydrocarbon resins, are generally utilized in heatset inks and may be used in letterpress and web offset inks and news inks as well.

The printing vehicles may also contain oils of various types, of which, vegetable oils are the most commonly used. Oils are generally used according to their drying property and may be divided into drying oils, semi-drying oils or non-drying oils. Linseed oil is the most commonly used drying oil. Alkali refined linseed oil is preferred as it has a lower acid value than acid refined linseed oil and gives good flow, quick setting, good durability, color retention and water resistance. A small percentage of such oil may be used when minimum penetration is required as it can lead to reducing problems such as chalking or piling.

Alkyd, namely, polymeric esters resulting from the condensation of a polyhedric alcohol or polyol with a dibasic acid or a monobasic fatty acid derived from

triglycerides and vegetable oils may be employed in the printing ink vehicles. Alkyds generally are utilized for the provision of oxidative drying sites for fast drying active sites for gelation. They also increase the solubility of the system utilizing insoluble esters of phenolic modified rosin and improved pigment wetting. Alkyds may also increase the adhesion or binding to the substrate and increase the percent solids of the vehicle. Alkyds present in the vehicle result in a dried film of increased toughness, mar resistance and durability.

A major proportion of the vehicle is generally the solvent component. In many cases, the solvents utilized are petroleum derived, however, there may also be other organic compounds which will act as a solvent such as, for example vegetable oil fatty acid esterified with a simple alcohol or glycol as is described in commonly assigned U.S. Patent 5,178,672. When utilizing a petroleum distillate as a solvent, properties such as boiling range, aromatic content, viscosity and chemical composition are important and affect the properties of the vehicle formulated. As the boiling point of a petroleum distillate increases, the solvency power decreases. For heatset inks and vehicles, a solvent volatile enough to evaporate at the required oven temperature is selected to provide the most consistent and quickest drying. The aromatic contents and chemical make-up of the solvent affects the solvent and vehicle properties and its viscosity. For example, large amounts of aromatics in a solvent increases the solvency and dilutability of the vehicle but decreases the tack and viscosity. In contrast, isoparafins have low solvency and dilutability with high tack and tack stability. These properties are taken into account depending upon the type of ink to be manufactured and the inks' desired properties.

The vehicle may also contain rheological modifiers such as gelling agents to help lower the misting properties of a printing ink and to contribute to a faster setting

printing ink as well as controlling the flow properties of the ink. Such gelling agents are typically organometallic compounds of aluminum or polyamide resins. Preferred gelling agents for the vehicle of the present invention are the organometallic compounds of aluminum, in particular, aluminum soaps, aluminum alkoxides or oxyaluminum acylates, most preferably, oxyaluminum acylates such as oxyaluminum octoate. When utilizing a gelling agent in the vehicle, proper manufacturing considerations should be followed. Such considerations include manufacturing under an inert atmosphere, pre-dilution of the gelling agent with the solvent and slow addition of the pre-diluted gelling agent to the agitating vehicle.

Anti-oxidants may be added to the vehicles to retard auto-oxidation to prevent premature skinning of both the vehicle and the printing ink. Preferred such anti-oxidants are butylated hydroxy toluene (BHT) or hydroquinone.

One or more driers may also be added to aid in the oxidation drying of the ink film. Such driers are preferably metal salts of acylates, more preferably cobalt and manganese metal salts of octoates.

With respect to an individual printing ink vehicle to be utilized in formulating the paste printing ink, the solvent, in particular, the petroleum solvent or esterified vegetable oil fatty acids will generally comprise about 20 to 80% of the printing ink vehicle, more preferably about 30 to 70%, most preferably about 40 to 60%. The hard resin will generally be present in concentrations from about 15 to 65%, most preferably about 30 to 60%. The printing ink vehicle may also include other solvents such as, for example, vegetable oils. Such vegetable oils may be present in concentrations up to about 20%, most preferably up to about 10%. Liquid resins, called alkyds, may also be present in the printing ink

vehicle. These liquid resins are vegetable oil modified polyesters which may be used to help improve film flexibility and durability. Such alkyds may be present in concentrations up to about 25%, most preferably up to about 10%. When a gelling agent is present in the vehicle, the gelling agent is provided in concentrations up to about 2%, most preferably about 0.5 to 1.5% of the composition.

The paste printing ink according to the invention is prepared in a conventional manner by mixing one or more individual printing ink vehicles and other components in suitable percentages.

More particularly, the printing ink vehicle of the formulated printing ink will preferably contain the solvent in a concentration range of 15 to 40%, more preferably 20 to 35%, hard resins in a range of 15 to 25%, other solvents such as vegetable oil in a range of 0 to 15%, more preferably 5 to 10%, gelling agents in a range of 0 to 1%, more preferably 0.5 to 1.0%, waxes in a concentration of up to about 5%, more preferably up to 3% driers in a concentration of up to 5%, more preferably 1 to 3% and the surfactant in an amount sufficient to render the ink washable with an aqueous solution on clean-up. The concentration of pigment in the printing ink will generally be in the range of 10 to 30%, more preferably 15 to 20%.

The printing inks of the present invention include a surfactant present in an amount sufficient to render the ink washable with an aqueous solution on clean-up. The surfactant may be non-ionic, catonic or anionic with non-ionic surfactants to be preferred. The preferred non-ionic surfactants are C_8 to C_{14} acetylinic diols or glycols, alkoxy polyethoxyethanol, the ethylene oxide addux of primary or straight chain alcohols. Types of non-ionic surfactants are block copolymer surfactants (Pluronic™ and Tetronic™), polyether surfactants (Pluradot™), polyethylene glycols (Pluracol E™), polypropylene glycols

(Pluracol P™), polyalkoxylated polyethers (Pluracol W™), linear alcohol alkoxylates (Plurafac™), alkylphenol ethoxylates (Iconol™), alcohol alkoxylates (Iconol™ Decyl and Tridecyl), fatty alcohol ethoxylates (Industrol™), fatty amine ethoxylates (Icomeen™), polyethylene glycol fatty acid esters (Industrol™), castrol oil ethoxylates (Industrol™), sorbitan fatty acid esters (Kuplur™), sorbitan ester ethoxylates (Industrol™), phosphate esters (Klearfac™ and Indoil™), alkoxylated phenolic compounds (Iconol™), sorbitol esters (Industrol™), sorbitol ester ethoxylates (Twix™), fatty acid alkanolamides (Iconol™) and fatty amide ethoxylates (Icomid™). Such surfactants are commercially available, for example from Air Products and Chemicals Inc., specifically Surfynol™ 104 or Surfynol™ 61 as well as other members of the Surfynol™ series. Other examples of non-ionic surfactants are the Pluronic™ and Tetronic™ - Block Copolymer surfactants available from BASF under the trade names L-61, L-62 and L-82. All of the surfactants generally have HLB values at 25°C of from 0.5 to 7.0.

In addition to the non-ionic surfactant, cationic surfactants may also be utilized such as cetyl trimethyl ammonium salts, in particular, cetyl trimethyl ammonium chloride. Anionic surfactants may also be utilized although they do tend to get hydrolized in alkaline solutions. Anionic surfactants are suitable if used in moderate quantities of between 0.25 and 1.50 percent. One example of such an anionic surfactant is sodium dioctyl sulfo succinate available from Air Products and Chemicals Inc. under the trade name Aerosol - OT.

The surfactant is generally present in a range from about 0.25 percent to about 8.0 percent, more preferably 0.5 to 2.5 percent, most preferably about 2.0 percent.

Another aspect of the present invention relates to the aqueous clean-up of the print train utilizing the

printing ink of the present invention. The aqueous clean-up is accomplished utilizing an aqueous based cleaning solution at a pH of between about 8.5 and about 13.5, most preferably at a pH of 10 ± 1.0. The washing solution utilizes a detergent cleaner preferably a non-halogen biogradable cleaner utilizing a terpene such as d-limonene. One example of such a detergent product is that available under the trade name MAZCLEAN™ "W" from PPG. MAZCLEAN™ is present in the washing solution at a concentration of about 10 to 35 percent by volume. In addition, the washing solution also contains a surfactant, preferably a cationic surfactant, such as cetyl triethyl ammonium chloride, or an anionic surfactant such as sodium dioctyl sulfo succinate available from Air Products and Chemicals Inc. under the trade name Aerosol™ - OT at a ratio of 0.25 to 3.0 percent, preferably 0.5 to 2.0 percent, most preferably about 2.0 percent. In order to maintain the pH of the washing solution, a buffer is generally utilized, preferably a sodium bicarbonate/carbonate buffer at a concentration of about 1.0 to 2.0 percent. The washing solution may also contain anti-foaming agents, and depending upon the detergent utilized, may also contain masking agents such as #91894 MASK™ from Stanley S. Schoenmann Inc.

The following examples illustrate preferred embodiments of the present invention but the invention is not limited thereto. All percentages are based on weight.

Typical Heatset Lithographic inks formulated in accordance with the present invention will contain:

Pigment Red 57:1	15 - 20%
Hard Resin*	20 - 15%
Soya Oil Phthalic Alkyd	4 - 6%
Alkali Refined Linseed Oil (A.R.L.O.)	2 - 3%
Polyethylene Wax	2 - 3%
Aluminum Gellant	0.5%

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Antioxidant (eg. BHT)	0.2%
Petroleum Distillate (eg. 470 oil)	35 - 40%
Surfynol 104H™	~ 2%

* The resins generally used are neutral and/or functional hydrocarbon type, maleic and phenolic modified rosin esters.

A sheetfed lithographic formulation contains:

Pigment Red 57:1	15 - 20%
Hard Resin*	25 - 30%
Linseed Oil Alkyd	20 - 25%
Wax (eg. Polyethylene, PTFE)	2 - 3%
Antioxidant	0.1%
Driers (eg. Cobalt, Manganese type)	0.5 - 1.5%
Aluminum Gellant	0.25 - 0.5%
Petroleum Distillate (eg. 535 type)	35 - 40%
Pluronic L-62™	~ 5%

* The resins generally used are functional hydrocarbon type, maleic and phenolic modified rosin esters.

A coldweb news ink formulation according to the present invention contains:

Pigment Red 57:1	10 - 15%
Neutral Hydrocarbon Resin	15 - 20%
Clay	10 - 15%
Mineral Oil	50 - 60%
Cetyl Trimethyl Ammonium Chloride	~ 2.5%

A small offset/duplicator ink formulation contains:

Mineral Oil	10 - 15%
Hard Resin	20 - 30%
Alkyd	5 - 10%

Linseed Oil	5 - 10%
Pigment Black 7	25 - 30%
Pigment Blue 61	3 - 6%
BHT	0.2%
Petroleum Distillate	5 - 10%
Pluronic L-62™	5.0%

A business forms offset ink formulation contains:

Mineral Oil	10 - 15%
Hard Resin	20 - 30%
Alkyd	5 - 10%
Linseed Oil	5 - 10%
Pigment Black 7	25 - 30%
Pigment Blue 61	3 - 6%
BHT	0.2%
Petroleum Distillate	10 -15%
Surfonyl 104H™	2.0%

EXAMPLE 1

A CYAN PROCESS PASTE PRINTING INK

30 kg of a functional hydrocarbon resin solution in mineral oil (33.5% resin solids) was weighed into a pot along with 20 kg of a linseed oil/rosin modified phenolic resin body gum vehicle and 5 kg of a linseed oil isophthalic alkyd. These ingredients were mixed well on a mixer and 5 kg of 535 type petroleum distillate was added into the vortex. 28 kg of C.I. Pigment Black 7 along with 4 kg of C.I. Pigment Blue 61 were added slowly into the vortex and mixed until a temperature of 85°C was achieved. The product was then milled on a vertical shot mill to achieve a dispersion of 2/0 or better on an NPIRI Grind Gauge. The milled product was placed back on the mixer where 5 kg of 535 type petroleum distallate, 1 kg of 20% BHT in Linseed Oil and 2 kg of Surfonyl 104H were added to the vortex. The product was packaged into metal cans by passing it over a 3-roll mill.

In a similar manner as the above example, the following inks were prepared.

EXAMPLE 2

A heatset lithographic ink formulation was prepared containing:

	kg
C.I. Pigment Red 57:1	15
Hard Resin	23
Soy Oil Isophthalic Alkyd	5
Alkali Refined Linseed Oil	3
Polyethylene wax	2
Microcrystalline wax	1
Petrolatum	3
OAO Aluminum Gellant	0.5
BHT Antioxidant	0.2
470 Type Petroleum Distillate	27.3

500 Type Petroleum Distillate	18
Surfonyl 104H	2

EXAMPLE 3

A sheetfed lithographic ink formulation was prepared containing:

	kg
C.I. Pigment Red 57:1	19
Hard Resin	24
Linseed oil Isophthalic Alkyd	12
Polyethylene Wax	2
Polytetrafluoroethylene Wax	1
Hydroquinone antioxidant	0.1
7% Cobalt Octoate Drier	0.9
6% Manganese Octoate Drier	0.9
OAO Aluminum Gellant	0.5
535 Type Petroleum Distillate	34.6
Pluronic L-62	5

EXAMPLE 4

A coldset offset news ink formulation was prepared containing:

	kg
C.I. Pigment Red 57:1	13
Neutral Aromatic Hydrocarbon Resin	20
Clay	18
Mineral Oil	46.5
Cetyl Trimethyl Ammonium Chloride	2.5

EXAMPLE 5

A small offset/duplicator ink formulation was prepared containing:

	kg
Mineral Oil	15
Hard Resin	22
Linseed Oil Isophthalic Alkyd	10
Heat Bodied Linseed Oil (Z Viscosity)	7
C.I. Pigment Black 7	27

C.I. Pigment Blue 61	4
BHT Antioxidant	0.2
535 Type Petroleum Distillate	9.8
Pluronic L-62	5

EXAMPLE 6

A offset business forms ink formulation was prepared containing:

	kg
Mineral Oil	12
Hard Resin	22
Linseed Oil Isophthalic Alkyd	10
Heat Bodied Linseed Oil (Z Viscosity)	7
C.I. Pigment Black 7	27
C.I. Pigment Blue 61	4
BHT Antioxidant	0.2
535 Type Petroleum Distillate	15.8
Surfonyl 104H	2.0

EXAMPLE 7

A typical aqueous cleaning solution was prepared containing:

10:1 Sodium Carbonate/Bicarbonate	2%
MAZCLEAN "W"	16%
Sodium Hydroxide (pH 9.5 ± 0.2)	2%
Surfactant Solution	2%
Water	78%

The Sodium Hydroxide Buffer Solution was prepared by adding 51.5 g of Sodium Hydroxide, 18 g of sodium carbonate and 2 g of sodium bicarbonate to 1 l of water, heated to 50°C and mixed well till fully dissolved. The Surfactant Solution was prepared by adding 25 g of Aerosol OT to 100 ml of water, mixed and shaken vigorously till fully dissolved.

The aqueous cleaning of the print train is accomplished following a normal run by first disengaging the rollers from the substrate, the web or the sheet. A small quantity of washing solution, typically 20 to 50ml depending upon the length of the roller, is applied to the roller and the rollers are allowed to rotate for a short period of time, typically 30 seconds to 2 minutes. During this time, the ink on the rollers starts to solubilize. Once the ink is solubilized, the doctor blades are engaged with the rollers to remove the solubilized ink film.

The printing ink and the method of washing of the present invention result in a rapid and simple clean-up operation of a print train which may be accomplished in one step only without the utilization of any solvent which contain VOCs. In testing, it has been found that the method of the present invention utilizing the aqueous clean-up solution provides a similar degree of wash-up as that is achieved utilizing the volatile solvents of the prior art.

Although various preferred embodiments of the present invention have been described herein in detail, it will be appreciated by those skilled in the art, that variations may be made thereto without departing from the spirit of the invention or the scope of the appended claims.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. In a paste printing ink containing a suitable solvent, a hard resin having an acid number of 25 or less, pigment and other typical additives, the improvement comprising the addition of from about 0.25 percent to about 8.0 percent by weight of a surfactant to the printing ink to enable the ink to be water washable on clean-up.

2. A paste printing ink as claimed in claim 1 wherein the surfactant is present in a range from about 0.5 to 2.5 percent by weight.

3. A paste printing ink as claimed in claim 1 wherein the surfactant is present at a concentration of about 2.0 percent by weight.

4. A paste printing ink as claimed in claim 1 wherein the surfactant is a non-ionic, cationic, anionic or amphoteric surfactant.

5. A paste printing ink as claimed in claim 1 wherein the surfactant is a non-ionic surfactant.

6. A paste printing ink as claimed in claim 1 wherein the ink comprises solvent present in a concentration range of 15 to 40 weight %, hard resins in a concentration range of 15 to 25 weight %, vegetable oil in a range of 0 to 15 weight %, gelling agents in a concentration range of 0 to 1 weight %, waxes in a concentration of up to about 5 weight %, driers in a concentration of up to 5 weight %, pigment in a concentration range of 10 to 30 weight %, and the surfactant in a concentration range of 0.25 to 3.0 weight % to render the ink washable with an aqueous solution on clean-up.

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7. A paste printing ink according to claim 5 wherein the printing ink is a heatset lithographic printing ink comprising:

Pigment Red 57:1	15 - 20 weight %
Hard Resin	20 - 15 weight %
Soya Oil Phthalic Alkyd	4 - 6 weight %
Alkali Refined Linseed Oil	2 - 3 weight %
Polyethylene Wax	2 - 3 weight %
Aluminum Gellant	0.5 weight %
Antioxidant	0.1 weight %
Petroleum Distillate Solvent	35 - 40 weight %
Non-Ionic Surfactant	~ 2 weight %.

8. A paste printing ink according to claim 5 wherein the printing ink is a sheetfed lithographic printing ink comprising:

Pigment Red 57:1	15 - 20 weight %
Hard Resin	25 - 30 weight %
Linseed Oil Alkyd	20 - 25 weight %
Wax	2 - 3 weight %
Antioxidant	0.1 weight %
Driers	0.5 - 1.5 weight %
Aluminum Gellant	0.25 - 0.5 weight %
Petroleum Distillate Solvent	35 - 40 weight %
Non-Ionic Surfactant	~ 5 weight %.

9. A paste printing ink according to claim 5 wherein the printing ink is a coldweb news printing ink comprising:

Pigment Red 57:1	10 - 15 weight %
Neutral Hydrocarbon Resin	15 - 20 weight %
Clay	10 - 15 weight %
Mineral Oil	50 - 60 weight %
Cationic Surfactant	~ 2.5 weight %.

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10. A method for cleaning a printing apparatus with an aqueous cleaning solution, the method comprising utilizing a conventional paste printing ink containing a suitable solvent, a hard resin having an acid number of 25 or less, pigment and other typical additives, to which from about 0.25 weight percent to about 8.0 percent of surfactant has been added in combination with an acidic fountain solution and washing the printing apparatus with a aqueous washing solution at a pH of between about 8.5 and 13.5, the washing solution containing detergent and a small amount of surfactant.

11. A method as claimed in claim 10 wherein the surfactant is present in the paste printing ink in a range from about 0.5 to 2.5 weight percent.

12. A method as claimed in claim 10 wherein the surfactant is present in the paste printing ink at a concentration of about 2.0 weight percent.

13. A method as claimed in claim 10 wherein the surfactant in the paste printing ink is a non-ionic surfactant.

14. A method as claimed in claim 10 wherein the paste printing ink comprises solvent in a concentration range of 15 to 40 weight %, hard resins in a concentration range of 15 to 25 weight %, vegetable oil in a range of 0 to 15 weight %, gelling agents in a concentration range of 0 to 1 weight %, waxes in a concentration of up to about 5 weight %, driers in a concentration of up to 5 weight %, pigment in a concentration range of 10 to 30 weight %, and the surfactant in a concentration range of 0.25 to 3.0 weight % to render the ink washable with the aqueous solution on clean-up.

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15. A method as claimed in claim 10 wherein the washing solution utilizes as a detergent, a non-halogen biogradable cleaner utilizing a terpene.

16. A method as claimed in claim 15 wherein the terpene is d-limonene.

17. A method as claimed in claim 10 wherein the detergent is present in the washing solution at a concentration of about 10 to 35 percent by volume.

18. A method as claimed in claim 10 wherein the sufactant in the washing solution is a cationic or anionic surfactant present in a concentration of about 0.25 to 3.0 percent by volume.

19. A method as claimed in claim 10 wherein the washing solution includes a buffer to maintain the pH of the washing solution.

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ABSTRACT OF THE DISCLOSURE

The present invention is directed to a paste printing ink containing a suitable solvent, a hard resin, pigment and other typical additives, the improvement comprising the addition of a small amount of a surfactant to the printing ink to enable the ink to be water washable on clean-up. The invention is also directed to a method for cleaning the printing apparatus with an aqueous cleaning solution, the method comprises utilizing a conventional printing ink to which a small amount of surfactant has been added in combination with an acidic fountain solution and washing the printing apparatus with a aqueous washing solution at a pH of between about 8.5 and 13.5, the washing solution containing detergent and a small amount of surfactant.